



Envisioning Futures

Visualising Newcastle City Futures 2065



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1. Objective

The objective of this project was to create an accompanying visualisation for the Newcastle City Futures 2065 Report and to contribute to knowledge exchange and public engagement activities for the 'Greater Newcastle' city region development case study by exploring appropriate visualisation methodologies and techniques.

2. Background

The Future of Cities Foresight Programme looks into the opportunities and challenges that UK cities will be facing over the next 50 years. The Newcastle City Futures 2065 Project, one of many projects funded by the Future of Cities Foresight Project, looked into the long-term future of cities over the next 50 years using Newcastle upon Tyne as a pilot. One of the themes identified from this report for potential future work, was the visualisation of long-term scenarios specific to Newcastle. By applying the "anchoring universities in urban regions through city foresight" view, Northumbria University and its Virtual Reality Visualisation (VRV) Studio were appointed for the visualisation of long-term scenarios specific to Newcastle.

Since 2005, researchers within the VRV Studio have established significant experience in the area of virtual city modelling. In 2008 a definitive, accurate and interactive city model, [Virtual NewcastleGateshead](#) (VNG), was created in partnership between Northumbria University and two local authorities (Newcastle City Council and Gateshead Council). Currently more than 100km² of Newcastle and Gateshead's city centres and their conurbations are modelled, stretching as far as Newcastle Airport in the North and to the Port of Tyne to the East. Since the beginning, by identifying stakeholder requirements, the city model is developed to assist urban planning processes. Over the years, numerous large and small scale urban development proposals have been supported. Apart from these enterprise activities, VNG actively assists and engages with research and teaching activities within Northumbria University. Like the city itself, city models are never the end products but are constantly evolving; with this in mind, the model is regularly updated and issues pertaining to confidentiality and commercially sensitive information regarding new developments are managed securely. The team has recently also started to model core areas of Sunderland (6.5km²) to create an interactive city model in line with Sunderland City Council's requirements.



Figure 1. Virtual NewcastleGateshead model (core areas)

2.1 Project Aims

1. Work with Newcastle University in developing the best possible ways of envisioning the scenarios.
2. Establishing visualisation methodology to guide similar processes in other cities.
3. To support knowledge exchange and public engagement activities for the Newcastle Futures Project.

3. Visualising the City

Successful city planning involves a visual communication process. Initiating this communication process can help to bridge the gap of understanding the issues and the solutions and the gap between the local authorities and the other stake holders and public. Accuracy of visualisation is critical and the abstraction level that defines the level of detail and realism of the visualisation plays an important part.

From the governance point of view, visualising the city is a not a new concept. Historically we can observe many different visualisation tools that were used to visualise an urban environment, for example aerial view maps of medieval times, more accurate city plan projections of the Renaissance, or the standardised and inexpensively produced, printed 2D maps of the 19th century. Since the early 20th century, the utilization of wooden and/or cardboard three dimensional (3D) urban models became very popular in local authorities for planning purposes. These are still being used all over the world in order to show changes to the urban fabric. However, physical scale models are expensive and difficult to alter and they are not flexible tools to rapidly display the effects of new developments at a scale that is easy to understand.

More informed decisions can be taken by utilizing digital 3D modelling tools, whereby viewers can observe the proposed developments at a human scale rather than in the 'bird's eye view' perspective. Thankfully current technology allows us to visualise cities in different digital formats, providing the flexibility to reflect on ever-changing and complex urban structures. Enhanced 3D modelling and rendering techniques not only allow the production of realistic still images but also enable planners to utilize animations and walkthroughs.

Visualisation, whether it is a perspective drawing, a hand-made physical model, a photomontage, a Virtual Reality (VR) model, an Augmented Reality (AR) experience, GIS based 3D representations or a 3D print model of a proposed scheme, focuses not only on what the proposed scheme is going to be, but also how it will impact on its surroundings. Visualisation in planning can, for example, be used for design and planning control, visibility analyses, and designating view corridors.

3.1. Visualising Scenarios

Visualising scenarios, as opposed to visualising future developments, requires different approaches. When visualising future developments, there is a sense of certainty for most of the features that are being visualised. For scenario visualisation, however, that certainty is replaced with possibilities that depend on various factors and constraints.

Many tools can be utilized in order to visualise the future scenarios for a city. The majority of them will start with a 3D model. Nowadays access to 3D city models is reasonably easy and affordable. 3D city models can be purchased from companies which create such models by employing aerial photogrammetry techniques. Also 3D laser scanning, procedural modelling and other tools and techniques can be used to create 3D city models. These models are in general compatible with many different 3D modelling software.

The type of outputs is determined by considering how the visualisation will be used and which platforms viewers will employ to view them. Animations or walkthroughs are becoming common tools to represent future developments. These are one step further than using digital or analogue photomontages, which impose set viewpoints upon the viewer.

3.1.1. Methodology

The project adopted standard visualisation project methodology, but great care was taken to emphasise that *scenarios* are being presented, rather than approved projects for the future.

a. Requirement analysis and the purpose of the final output

Consultation with the Future of Cities Foresight Project Team and the Newcastle University team took place early on, in order to understand the requirements of the end product. The Newcastle City Futures 2065 Report has also been analysed in depth and re-occurring themes have been identified, so that these will feed into the final product. It was decided at this stage that instead of providing visualisations for the three different scenarios from the Newcastle City Futures 2065 Report, a combined output would be created which would give an idea of a possible future.

b. Develop a storyboard of ideas

From the start of the project, discussions took place within the team about how to represent the complex content in the scenarios. Following this, the order of various pieces and when, where and how these will be brought together was decided. Two different story-telling ideas were established, the “advertisement board” and the “train journey”. Eventually from these two options the “train journey” route was thought to be the most appropriate option. Following this decision, four key scenes have been identified. These scenes are important information points from the Newcastle City Futures 2065 Report. These four areas are:

- Newcastle Airport and its surrounding area
- The River Tyne and surrounding areas- focusing on alternative transport options
- Transport links, focusing on the HS2/HS3 lines and accessibility
- A vehicle-free city centre, hosting major sports, arts and recreation events.

Ultimately, a final storyboard was established around these four scenes and discussions took place again with the stakeholders to get their input. It is important to point out here that conveying relevant information, rather than the city model’s similarity to the real world, should be the focus in such scenario visualisations. Therefore it was decided that some scenes would be more schematic than others, portraying a wide range of activities, at a wider geographical scale, while the level of detail on the other scenes will be lower.

c. Define and Agree output type

Discussions took place concerning the type of output styles that should be produced from the many options available: still renders, animations, interactive visualisations, 3D prints etc. The decision was made to produce an animation and some still renders. We believe that the selected output styles are also the most convenient options for the dissemination purpose, both for the UK Government Office for Science Future of Cities Project and for the Newcastle University team.



Figure 2. Various visualisation tools and techniques

d. Develop the draft output

A draft animation was created and shared with the stakeholders to get their feedback. Following this approval, final renders and post-processing was completed in order to complete the project.

e. End product

The ultimate animation conveys a future train journey from London to Newcastle upon Tyne, where the traveller gains insight on Newcastle by using a touch screen viewer. This viewer provides information regarding the past, the present and the future of the City. The introductory scenes focus on the industrial and technically innovative history of Newcastle and its current day attributes, whereas the main animations focus on the scenarios, by portraying them via location based animations supported by text from the Newcastle City Futures 2065 Report.

Scenes from the Animation

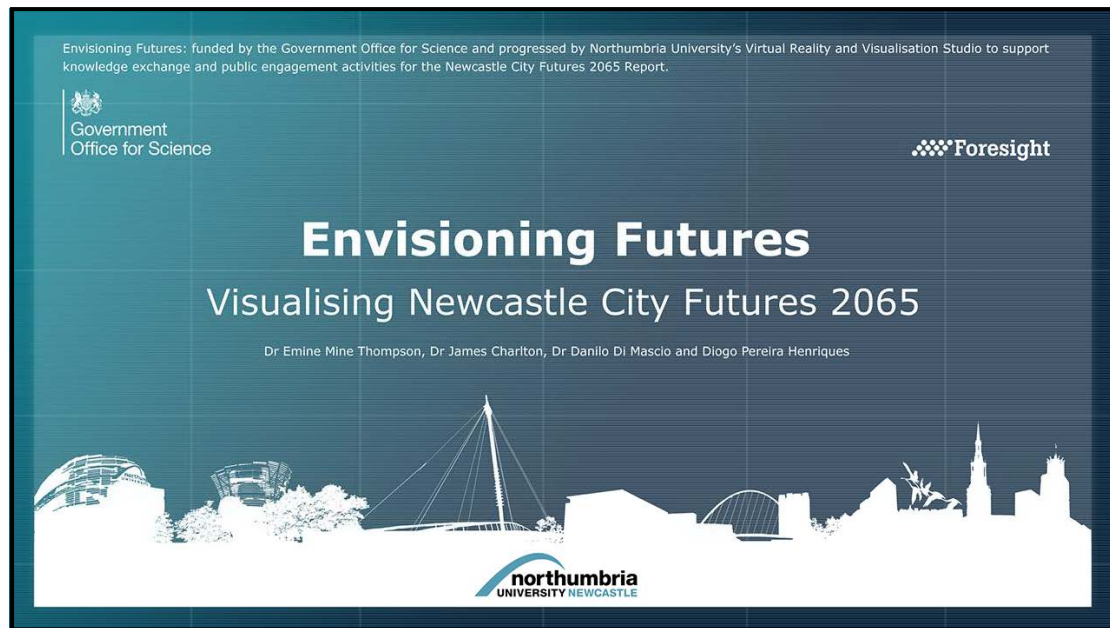


Figure 3. Main title scene



Figure 4. Train scene

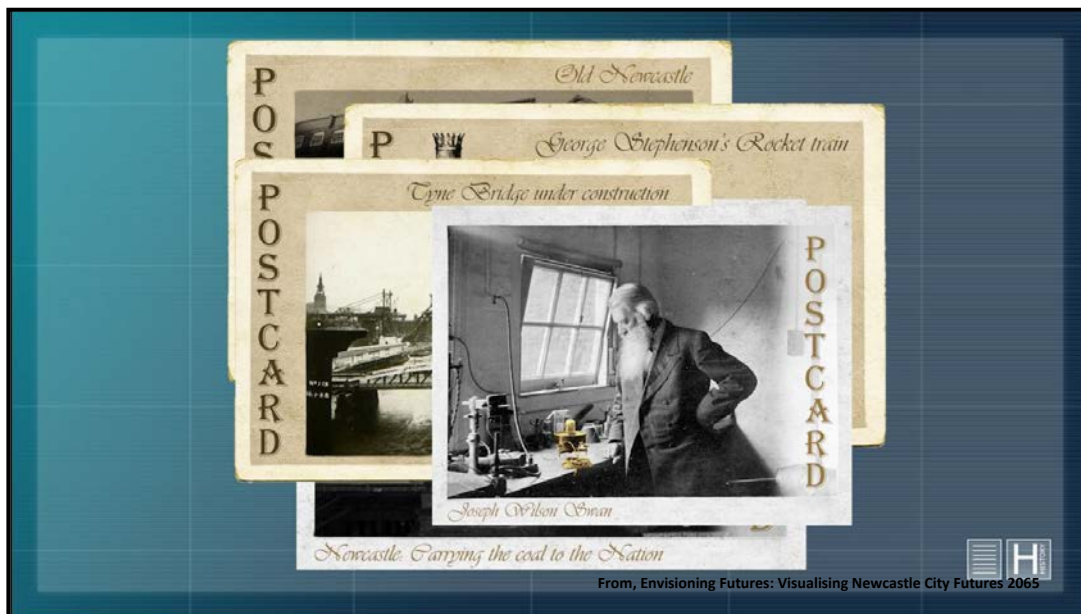


Figure 5. Industrial heritage of Newcastle upon Tyne



Figure 6. Future transport links



Figure 7. Future: vehicle-free routes, pedestrianised city centre locations.



Figure 8. Future River Tyne passenger services, e-mobility and more sustainable transport options for the city

4. Reflections

By providing representations to communicate proposed developments, all types of visualisation play a vital role in public engagement activities. Novel tools and techniques, such as virtual reality, augmented reality or real-time visualisations, are very effective and they give some level of autonomy to the participants to go wherever they want to go in the model, and examine the suggested changes, rather than just viewing them from a set animation path or studying them in the still renders.

More than one thousand cities across the world have a partial or full city models and this number is still rising. Nonetheless scenario visualisations can be tackled with different tools rather than utilizing 3D city modelling techniques such as; photomontages, maps, schematic representations, handmade 3D models, etc.

Whatever the medium, visualisations can sometimes be unsettling for some during public engagement activities, if visualisations are mistakenly presented or viewed as final products instead of consultation tools. This generally happens when the visualisation is highly realistic. In order to avoid these types of situations, abstraction levels and the level of detail should be carefully set and appropriate information should accompany the visual outputs.

Although an augmented reality application might have been an interesting option for this work, bringing the actual city and the scenarios together in one setting, several constraints influenced the choice of output type. Apart from time limitations, there were also the considerations of accessibility, operability and distribution of the visualisation. An animation and still renders best met these criteria. Scenarios, explained in the Newcastle City Futures 2065 Report, *“are not intended to be predictions about the future but provide a prompt for discussion about the choices and decisions that would need to be made to generate ideas or visions of the future for a specific place and, simultaneously, avoid unpalatable future outcomes”*. With this in mind, it is also important to emphasise that the visualisations are based on these scenarios, and are intended for discussion and to generate ideas between different stake-holders in the city. To reiterate, the animation does not reflect the reality and these images and animation shouldn't be taken out of context.

It is also clear that digital technologies are everywhere and that they here to stay. Technological developments in visualisation are providing us with unique opportunities. Virtual Reality and Augmented Reality, 3D stereoscopic technologies and mobile/tablet based 3D graphic tools and technologies are highlighting that, in the very near future, real-time interactions with real and modelled realities will be utilized in many AEC industries and in city planning.